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A new species of *Micryletta* Dubois, 1987 (Anura, Microhylidae) from Yunnan Province, China

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Abstract

A new species of the genus *Micryletta* Dubois, 1987 is described from Yunnan Province, China, based on morphological and molecular analyses. The most obvious differences between the new species and other species of this genus are small body size, unique coloration, and relatively longer hind limbs. In 16S rRNA gene sequences, the new species is diverged from all other congeners by 3.1%–8.0%.

Key Words

16S rRNA, Hekou County, Honghe Prefecture, Paddy Frog, taxonomy

Introduction

The genus *Micryletta* was originally described by Dubois (1987). Initially, *Micryletta* was considered to be synonymous with *Microhyla* (Zhao and Adler 1993; Fei 1999), and eventually, it was shown to be phylogenetically distinct in the subfamily Microhylinae (Frost et al. 2006; Van der Meijden et al. 2007; Kurabayashi et al. 2011; Pyron and Wiens 2011; De Sá et al. 2012; Blackburn et al. 2013; Peloso et al. 2016; Tu et al. 2018; Poyarkov et al. 2018; Garg and Biju 2019).

To date, the genus *Micryletta* comprises nine recognized species: *M. aishani* Das, Garg, Hamidy, Smith & Biju, 2019; *M. dissimulans* Suwannapoom, Nguyen, Pawangkhanant, Gorin, Chomdej, Che & Poyarkov, 2020; *M. erythropoda* (Tarkhnishvili, 1994); *M. immaculata* Yang & Poyarkov, 2021; *M. inornata* (Boulenger, 1890); *M. lineata* (Taylor, 1962); *M. nigromaculata* Poyarkov, Nguyen, Duong, Gorin & Yang, 2018; *M. steinegeri* (Boulenger, 1909); and *M. sumatrana* Munir, Hamidy, Matsui, Kusrini & Nishikawa, 2020. Among them, *M. lineata* had been regarded as a subspecies of *M. inornata* until it was recently elevated to full species (Zug and Mulcahy 2020; Miller et al. 2021).

During our fieldwork in Honghe Prefecture, Yunnan Province, China, in May 2021, two specimens of the genus *Micryletta* were collected from Hekou County. Phylogenetic analysis based on the 16S rRNA mtDNA gene showed the two specimens distinct from all other species of the genus. Thus, we describe these two specimens as a new species.

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Materials and methods

Field survey in Hekou County, Honghe Prefecture, Yunnan Province, China (Figure 1), was carried out under the permission of Daweishan National Natural Reserve Management and Protection Bureau. Specimens were fixed and preserved in 75% ethanol and deposited at Kunming Natural History Museum of Zoology, Kunming Institute of Zoology, Chinese Academy of Sciences (KIZ). Measurements were taken to the nearest 0.1 mm with digital calipers. Paired measurements were made on the left side. The descriptions of morphological characteristics followed Poyarkov et al. (2018) with minor modifications. SVL: snout–vent length, measured from the tip of the snout to cloaca; HL: head length, measured from the tip of snout to hind border of jaw angle; SL: snout length, measured from the anterior corner of eye to the tip of snout; EL: eye length, measured as the distance between anterior and posterior corners of the eye; NEL: nostril–eye length, measured as the distance between the anterior corner of the eye and the nostril center; HW: head width, measured as the maximum width of head on the level of mouth angles in ventral view; IND: internarial distance, measured as the distance between the central points of nostrils; IOD: interorbital distance, measured as the shortest distance between the medial edges of eyeballs in dorsal view; UEW: upper eyelid width, measured as the maximum distance between the medial edge of eyeball and the lateral edge of upper eyelid; TMP: Tympanum length, measured as the horizontal tympanum diameter; FLL: forelimb length, measured as the length of straightened forelimb to the tip of third finger; LAL: lower arm and hand length, measured as the distance between elbow and the tip of third finger; HAL: hand length, measured as the distance between the proximal end of outer palmar (metacarpal) tubercle and the tip of third finger; 1FL: first finger length, measured as the distance between the tip and the distal end of inner palmar tubercle; IPTL: inner palmar tubercle length, measured as the maximum distance between proximal and distal ends of inner palmar tubercle; OPTL: outer palmar tubercle length, measured as the maximum diameter of outer palmar tubercle; 3FDD: third finger disk diameter; HLL: hindlimb length, measured as the length of straightened hindlimb from groin to the tip of fourth toe; TL: tibia length, measured as the distance between the knee and tibiotarsal articulation; FL: foot length, measured as the distance between the base of the inner metatarsal tubercle to the tip of the fourth toe; IMTL: inner metatarsal tubercle length, measured as the maximum length of inner metatarsal tubercle; 1TOEL: first toe length, measured as the distance between the distal end of inner metatarsal tubercle and the tip of first toe; 4TDD: fourth toe disk diameter. We compared morphological characters of the new species with other members of the genus relying on original species descriptions (Boulenger 1890, 1909; Taylor 1962; Tarkhnishvili 1994; Poyarkov et al. 2018; Das et al. 2019; Munir et al. 2020; Suwannapoom et al. 2020; Yang and Poyarkov 2021) and the additional data from Yang and Poyarkov (2021).

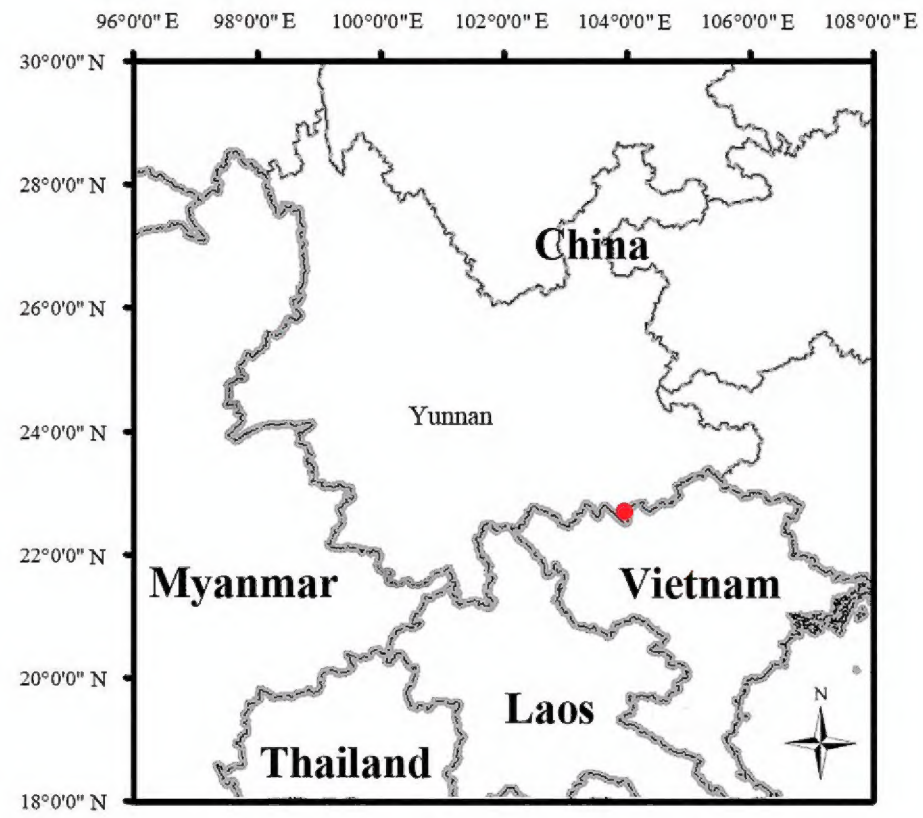

Figure 1. Map showing the type locality (red dot) of *Micryletta hekouensis* sp. nov.

Total genomic DNA was extracted from liver tissues using the standard phenol-chloroform method (Hillis et al. 1996; Sambrook and Russell 2001). A fragment encoding mitochondrial 16S rRNA gene was amplified and sequenced. The primers L2188 (Matsui et al. 2006): 5'–AAAGTGGGCCTAAAAGCAGCCA–3' and 16H1 (Hedges 1994): 5'–CTCCGGTCTGAACTCAGATCACGTAGG–3' were used in amplification and cycle sequencing. Amplified DNA was produced in 20 µl reactions after an initial denaturation step of 5 min at 94 °C and 43 cycles of denaturation for 1 min at 94 °C, annealing for 1 min with the TouchDown program from 65 °C to 55 °C reducing 1 °C every cycle, extension for 1 min at 72 °C, and final extension for 5 min at 72 °C. PCR products were isolated through electrophoresis using 1.5% agarose gel, and further purified using Millipore Microcon Kits. Purified PCR products were sequenced by Davis Sequencing using BigDye terminator 3.1 and sequences were edited and manually managed using SeqMan in Lasergene 7.1 (DNASTAR Inc., Madison, WI, USA) and MEGA X (Kumar et al. 2018).

All new sequences have been deposited in GenBank, sequences of all eight nominal *Micryletta* taxa, including type specimens of *M. aishani* (India), *M. dissimulans* (Songkhla, Thailand), *M. immaculata* (Hainan, China), *M. nigromaculata* (Vietnam), and *M. sumatrana* (Sumatra, Indonesia), topotype specimens of *M. inornata* (Sumatra, Indonesia), *M. erythropoda* (Ma Da, Dong Nai, Vietnam), and *M. steinegeri* (Taiwan, China), as well as *M. inornata* sensu stricto from Tanintharyi, Myanmar, and *M. lineata* from southern Thailand and Myanmar (Poyarkov et al. 2018; Alhadi et al. 2019; Das et al. 2019; Munir et al. 2020; Suwannapoom et al. 2020; Miller et al. 2021; Yang and Poyarkov 2021) were downloaded from Genbank (Table 1). Sequences of *Mysticellus fran-*

Table 1. Localities, voucher information, and GenBank accession numbers for all specimens used in molecular analyses in this study.

Species	Voucher	Locality	Accession No.
Micryletta aishani	SDBDU 3920	India: Assam, Cachar district, Subhong	MK889218
Micryletta dissimulans	AUP01690	Thailand: Songkla Prov., Saba Yoi district	MT573414
Micryletta dissimulans	AUP01691	Thailand: Songkla Prov., Saba Yoi district	MT573415
Micryletta dissimulans	AUP01696	Thailand: Songkla Prov., Saba Yoi district	MT573416
Micryletta dissimulans	AUP01698	Thailand: Songkla Prov., Saba Yoi district	MT573413
Micryletta erythropoda	ZMMU A4721-1533	Vietnam: Dong Nai, Ma Da (Vinh Cuu) N.R.	MH756146
Micryletta erythropoda	ZMMU A4721-1542	Vietnam: Dong Nai, Ma Da (Vinh Cuu) N.R.	MH756147
Micryletta immaculata	KFBG 14270	China: Hainan, Exian	MW376736
Micryletta immaculata	KFBG 14271	China: Hainan, Exian	MW376737
Micryletta inornata	MZB Amph 23949	Indonesia: Sumatra, Deli Serdang	LC208135
Micryletta inornata	MZB Amph 23947	Indonesia: Sumatra, Deli Serdang	LC208136
Micryletta inornata	MZB Amph 23948	Indonesia: Sumatra, Deli Serdang	LC208137
Micryletta inornata	MZB Amph 27242	Indonesia: Sumatra, Aceh	LC208138
Micryletta inornata	USNM 587625	Myanmar: Tanintharyi	MT609033
Micryletta inornata	USNM 587901	Myanmar: Tanintharyi	MT609034
Micryletta lineata	KUHE 23858	Thailand: Ranong	AB634695
Micryletta lineata	CAS 247206	Myanmar: Tanintharyi Div., Kawthaung dist.	KM509167
Micryletta nigromaculata	ZMMU A5947	Vietnam: Hai Phong, Cat Ba N.P.	MH756148
Micryletta nigromaculata	ZMMU A5937	Vietnam: Hai Phong, Cat Ba N.P.	MH756149
Micryletta nigromaculata	ZMMU A5946	Vietnam: Hai Phong, Cat Ba N.P.	MH756151
Micryletta nigromaculata	DTU 301	Vietnam: Ninh Binh, Cuc Phuong N.P.	MH756154
Micryletta steinegeri	KUHE 35937	China: Taiwan, Yunlin	AB634696
Micryletta steinegeri	ZMMU A5336-1	China: Taiwan, Kaohsiung	MW376732
Micryletta steinegeri	ZMMU A5336-2	China: Taiwan, Kaohsiung	MW376733
Micryletta steinegeri	ZMMU A5336-3	China: Taiwan, Kaohsiung	MW376734
Micryletta sumatrana	/	Indonesia: Sumatra Selatan	MN727065
Micryletta hekouensis sp. nov.	KIZ20210510	China: Honghe, Hekou	MZ536627
Micryletta hekouensis sp. nov.	KIZ20210511	China: Honghe, Hekou	MZ536628
Mysticellus franki	ZSI/WGRC/V/A/967	India: Kerala, Wayand	MK285340
Kaloula pulchra	NMNS 3208	China	KC822614
*Uperodon systo*ma	SDBDU 2005.4723	India: Tamil Nadu: Kunnapattu	MG557949

ki, *Kaloula pulchra* and *Uperodon systoma* were used as outgroups according to Suwannapoom et al. (2020) and Yang and Poyarkov (2021).

Sequences were aligned using ClustalW (Thompson et al. 1994) integrated in MEGA X (Kumar et al. 2018) with default parameters. Genetic divergences (uncorrected p-distance) were calculated in MEGA X with the parameters Transitions + Transversions, Uniform rates, and Pairwise deletion (Kumar et al. 2018). The best substitution model GTR+F+G4 was selected using the Akaike Information Criterion (AIC) in ModelFinder (Kalyaanamoorthy et al. 2017). Maximum likelihood phylogenetic analysis was performed in IQ-TREE 1.6.12 (Nguyen et al. 2015), and nodal support was estimated by 1,000 ultrafast bootstrap (UFB) replicates. Nodes with UFB values of 95 and above were considered significantly supported (Minh et al. 2013). Bayesian Inference was performed in MrBayes 3.2.7 (Ronquist et al. 2012) based on the selected substitution model. Two runs were performed simultaneously with four Markov chains starting from a random tree. The chains were run for 1,000,000 generations and sampled every 100 generations. The first 25% of the sampled trees were discarded as burn-in after the standard deviation of split frequencies of the two runs was less than a value of 0.01, and then the remaining trees were used to create a 50% majority-rule consensus tree and to estimate Bayesian posterior probabilities (BPP). Nodes were considered well-supported if they had BPP of 0.95 or higher (Huelsenbeck et al. 2001; Wilcox et al. 2002).

Results

Bayesian inference and Maximum likelihood analyses recovered consistent topology (Figure 2) and agreed essentially with earlier phylogenies of *Micryletta* (Poyarkov et al. 2018; Das et al. 2019; Suwannapoom et al. 2020; Yang and Poyarkov 2021). The two specimens from Hekou County were nested in the genus *Micryletta* and formed a distinct clade sister to a clade consisting of *M. immaculata* and *M. steinegeri* with strong support.

The genetic divergences between the two specimens from Hekou County and all other congeners ranged from 3.1% (with *M. steinegeri*) to 8.0% (with *M. nigromaculata*) (Table 2).

Micryletta hekouensis sp. nov.

http://zoobank.org/1CEEDB31-AFF2-427B-A219-860D0C0C991E

Figures 3–5

Type material. Holotype. KIZ20210510, adult male from Nanxi village, Nanxi Town, Hekou County, Honghe Prefecture, Yunnan Province, China (22°38'17"N, 103°59'8"E, elevation 350 m a.s.l.), collected by Shuo Liu at 23:50 on 15 May 2021.

Paratype. KIZ20210511, adult female from the same locality as for the holotype, collected by Shuo Liu at 21:15 on 17 May 2021.

Diagnosis. *Micryletta hekouensis* sp. nov. can be distinguished from its congeners by a combination of the

Table 2. Uncorrected p-distances (%) of 16S rRNA sequences among *Micryletta* species and outgroups.

	1	2	3	4	5	6	7	8	9	10	11	12
1 *Micryletta aishani*												
2 *Micryletta dissimulans*	4.4											
3 *Micryletta erythropoda*	4.7	7.4										
4 *Micryletta immaculata*	4.5	6.4	7.2									
5 *Micryletta inornata*	5.1	6.1	7.7	7.2								
6 *Micryletta lineata*	3.2	6.0	2.9	9.5	6.5							
7 *Micryletta nigromaculata*	4.7	5.2	8.2	8.0	6.7	7.0						
8 *Micryletta steinegeri*	3.5	4.8	6.6	4.2	5.6	5.1	7.1					
9 *Micryletta sumatrana*	5.9	5.1	9.1	8.3	8.2	7.4	5.5	6.0				
10 *Micryletta hekouensis* sp. nov.	3.5	5.0	6.4	4.6	5.7	4.6	8.0	3.1	6.7			
11 *Mysticellus franki*	8.6	9.3	10.2	9.4	9.8	8.8	10.0	9.0	10.7	9.2		
12 *Kaloula pulchra*	10.4	9.2	14.1	16.7	9.9	17.3	12.8	14.3	12.1	14.7	11.4	
13 *Uperodon systoma*	10.1	11.1	12.5	10.3	12.7	10.3	10.2	9.9	11.3	10.1	9.7	8.3

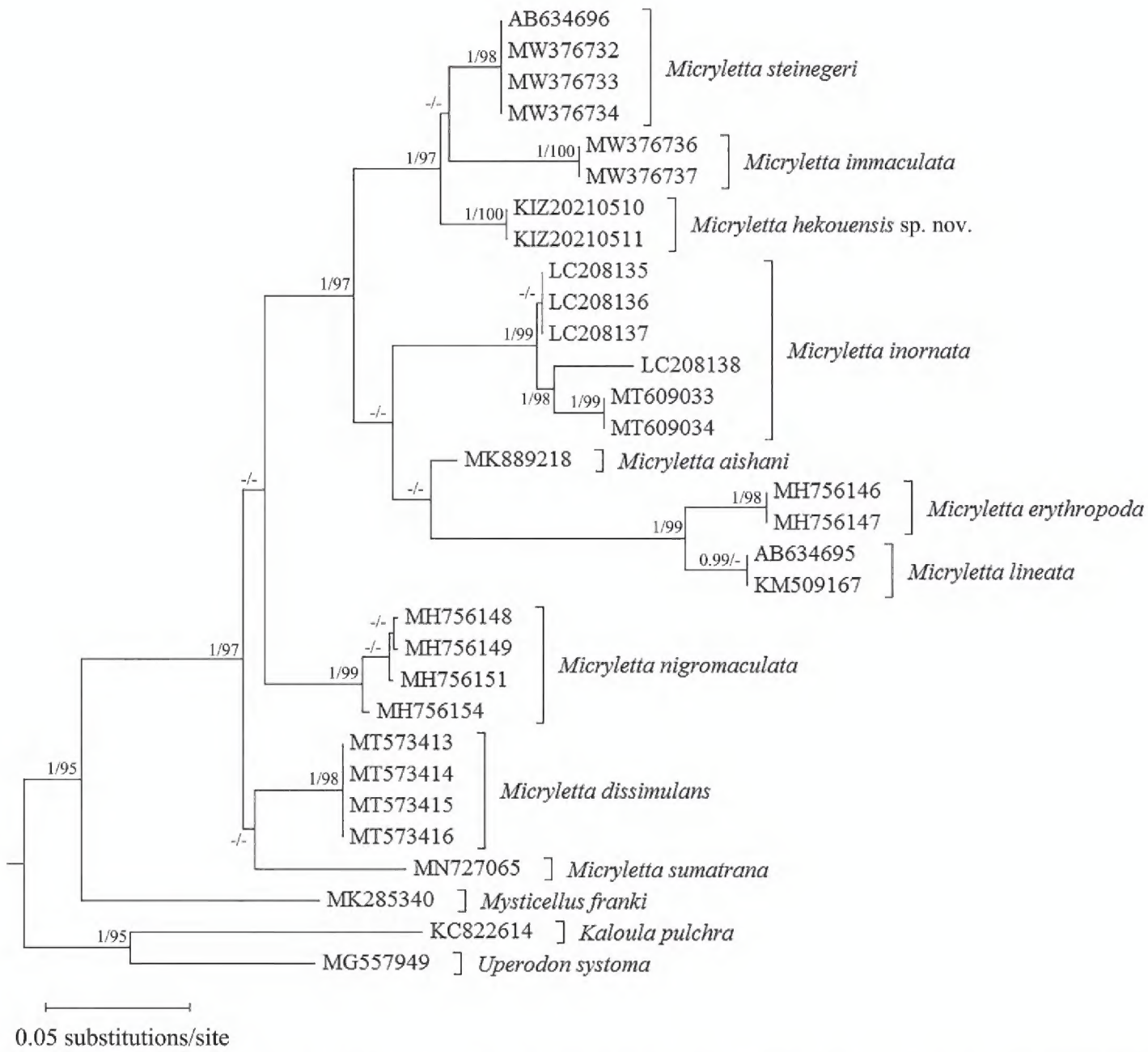

Figure 2. Bayesian Inference tree of *Micryletta* reconstructed on the base of 16S rRNA gene sequences. Values before slashes correspond to Bayesian posterior probabilities (>0.9 remain), and values after slashes correspond to Maximum Likelihood bootstrap replicates (>90 remain).

following characters: small-sized within genus (SVL 20.5–20.8 mm); areas above canthus rostralis, upper eyelids, areas posterior to eyelids, and dorsum of upper arms golden, other parts of dorsum almost solid black or yellowish grey with brownish black stripes; lateral sides of head and body black or yellowish grey, a white stripe from lower front of eye along upper lip back to anterior forelimb insertion; ventral side of body and limbs pink brown, chin region in adult males brownish black, small and irregular white marbling patterns on chest and lateral belly; supratympanic fold indistinct; outer metatarsal tubercle absent; webbing between toes absent; tibiotarsal articulation adpressed limb reaching level of front of eye.

Description of holotype. Adult male. SVL 20.5 mm; habitus relatively slender; head small and triangular, slightly wider (HW 6.9 mm) than long (HL 6.5 mm); snout (SL 2.9 mm) abruptly rounded in dorsal view and slightly acuminate in profile, projecting beyond margin of lower jaw; eyes relatively small, slightly protuberant, pupil oval, transverse, eye diameter (EL 2.5 mm) approximately equal to interorbital distance (IOD 2.4 mm). Top of head flat, canthus rostralis rounded and distinct; loreal region weakly concave; nostril round, closer to tip

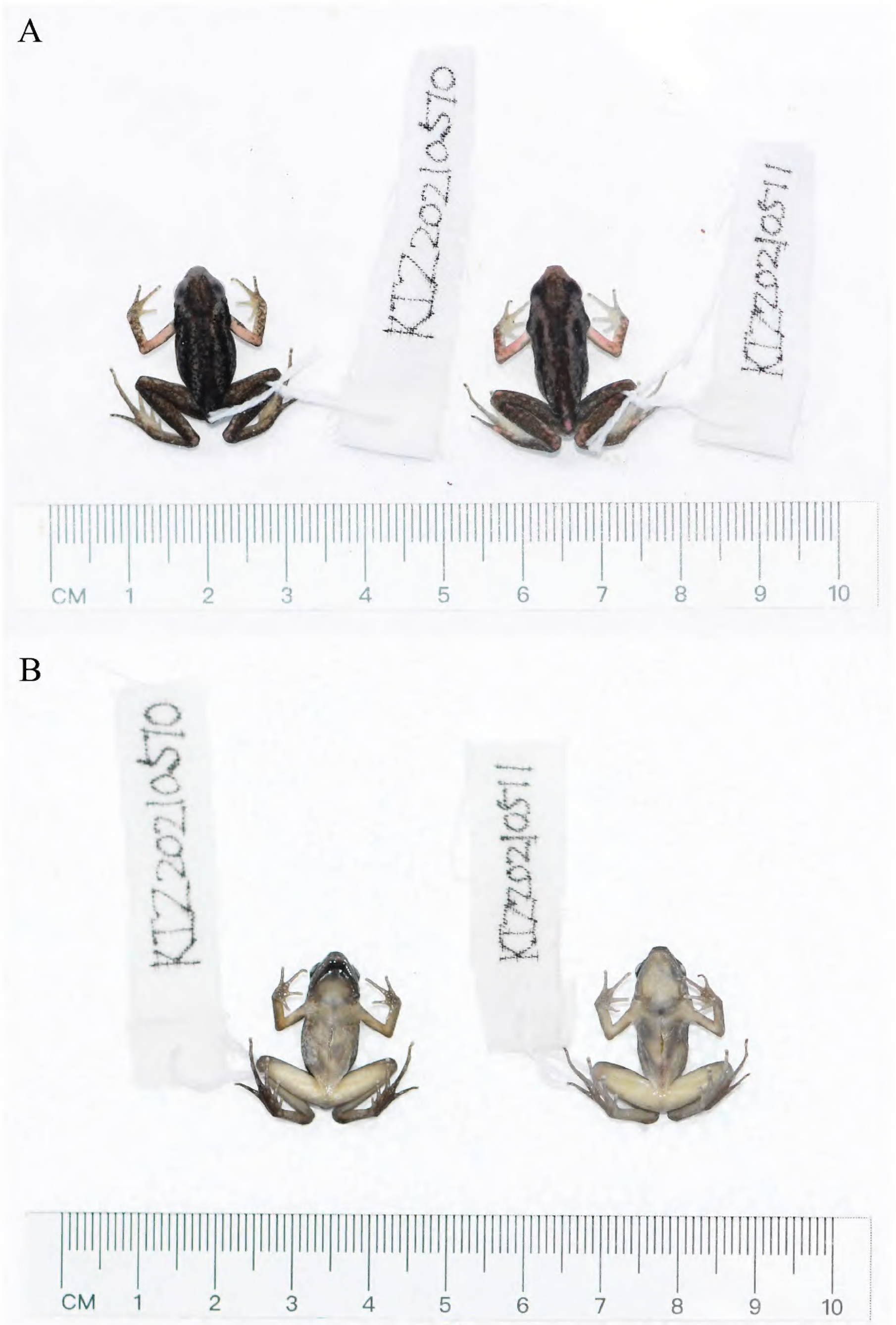

Figure 3. Type series of *Micryletta hekouensis* sp. nov. in preservative. **A.** dorsal view; **B.** ventral view.

Figure 4. Close-up views of the hand and foot of the holotype (KIZ20210510) of *Micryletta hekouensis* sp. nov. **A.** volar view of left hand; **B.** plantar view of left foot.

of snout than to eye; interorbital distance (IOD 2.4 mm) greater than internarial distance (IND 2.0 mm) and upper eyelid width (UEW 1.7 mm). Tympanum rounded, small (TMP 0.6 mm) and distinct; supratympanic fold very indistinct. Choanae rounded; vomerine teeth absent; opening of vocal sac long cleft; tongue slender, with no notch at posterior tip.

Forelimbs slender (FLL 14.9 mm), lower arm and hand length (LAL 10.9 mm) more than a half of snout-vent length (LAL/SVL 0.53). Fingers slender with no webbing, rounded in cross-section, no lateral fringes; first finger well-developed, second finger slightly shorter than fourth, relative finger lengths: I<II<IV<III; tips of fingers round and not dilated; subarticular tubercles on fingers distinct, rounded and prominent, formula 1, 1, 2, 2; supernumerary tubercles on palm present and developed; three metacarpal tubercles, inner one rounded and smallest (IPTL 0.4 mm), median one (MPTL 0.7 mm) rounded and almost directly in front of elongated outer one (OPTL 0.8 mm); two rounded and one elongated prominent supernumerary palmar tubercles on the base of fingers II–IV, respectively, slightly larger than inner metacarpal tubercle; nuptial pad absent.

Hindlimbs slender and long (HLL 33.3 mm), more than two times longer than forelimbs (HLL/FLL 2.23); tibia (TL 10.9 mm) slightly shorter than one-third of hindlimb length; tibiotarsal articulation of adpressed limb reaching level of front of eye; foot (FL 11.4 mm) slightly longer than tibia. Relative toe lengths: I<II<V<III<IV; tarsus smooth, tarsal fold absent; tips of toes round and not dilated, slightly wider than those of fingers; webbing between toes absent; subarticular tubercles on toes oval and prominent, formula: 1, 1, 2, 3, 2; dermal ridges present under 2nd to 4th toes but indistinct; inner metatarsal tubercle oval, prominent, and small (IMTL 0.7 mm); outer metatarsal tubercle absent.

Dorsal skin smooth above, scattered with tiny and flat tubercles on dorsum of body, flanks, and hindlimbs; subtle longitudinal median ridge present on dorsum; dorsolateral fold absent; lateral sides of head smooth; ventral skin of body and limbs smooth.

Coloration of holotype in life. Areas above canthus rostralis, upper eyelids, areas just posterior to eyelids, dorsum of upper arms, and areas above tibiotarsal articulation golden; other parts of dorsum of body black with two indistinct parallel longitudinal grey stripes on back; other parts of dorsum of limbs black mottled with gray and yellow. Lateral sides of head and body black, from lower front of eye along upper lip back to anterior forelimb insertion white; one indistinct longitudinal grey stripe on each side of body. Ventral side of body and limbs pinkish brown, chin region brownish black; small and irregular white marbling patterns on chest and lateral belly; some small white spots on lower lip. Iris bicolored, with upper third bronze and lower two-thirds brownish black.

Coloration of holotype in preservative. Colors faded; areas above canthus rostralis, upper eyelids, and areas just posterior to eyelids turned to dark grey; dorsum of upper arms turned to pink; ventral side turned to yellowish white with light gray marbling on chest and lateral sides of belly; colors of other parts of body almost the same as in life.

Variation. The female paratype is quite similar in appearance to the holotype (Table 3), but show some variations in coloration. The female paratype has a relatively lighter body color, areas above canthus rostralis, upper eyelids, areas posterior to eyelids, and dorsum of upper arms are golden, the same as holotype; however, midline of the back is brownish black, one discontinuous black

Table 3. Measurements (in mm) of the type specimens of *Micryletta hekouensis* sp. nov.

	KIZ20210510	KIZ20210511	Mean±SD (n=2)
SVL	20.5	20.8	20.65±0.21
HL	6.5	7.3	6.90±0.57
SL	2.9	2.8	2.85±0.07
EL	2.5	2.4	2.45±0.07
NEL	1.7	1.8	1.75±0.07
HW	6.9	7.1	7.00±0.14
IND	2.0	2.1	2.05±0.07
IOD	2.4	2.2	2.30±0.14
UEW	1.7	1.6	1.65±0.07
TMP	0.6	0.7	0.65±0.07
FLL	14.9	16.2	15.55±0.92
LAL	10.9	11.6	11.25±0.49
HAL	5.3	6.0	5.65±0.49
1FL	3.1	3.1	3.10±0.00
IPTL	0.4	0.4	0.40±0.00
MPTL	0.7	0.7	0.70±0.00
OPTL	0.8	0.8	0.80±0.00
3FDD	0.5	0.4	0.45±0.07
HLL	33.3	34.0	33.65±0.49
TL	10.9	10.8	10.85±0.07
FL	11.4	11.9	11.65±0.35
IMTL	0.7	0.8	0.75±0.07
1TOEL	2.6	3.1	2.85±0.35
4TDD	0.6	0.5	0.55±0.07

Figure 5. The holotype (KIZ20210510) and the paratype (KIZ20210511) of *Micryletta hekouensis* sp. nov. in life. **A.** dorsal view of the holotype; **B.** lateral view of the holotype; **C.** ventral view of the holotype; **D.** dorsal view of the paratype; **E.** lateral view of the paratype; **F.** ventral view of the paratype.

stripe dorsolateral on each side, lower parts of flanks greyish brown; other parts of dorsal and lateral body are yellowish grey; dorsa of lower arms and hindlimbs brownish grey with larger and more obvious irregular yellow spots. The color of the ventral side is similar to that of the holotype, except that the chin region is not brownish black but light yellow.

Sexual dimorphism. Male has opening of vocal sac and single hypopharyngeal vocal sac, female has no vocal sac and opening of vocal sac. Besides this, there is no significant morphological character difference between males and females.

Etymology. The specific epithet *hekouensis* refers to Hekou County, the type locality of the new species. We propose "Hekou Paddy Frog" for the common English name and "河口小姬蛙" (Hé Kǒu Xiǎo Jī Wā) for the common Chinese name of the new species.

Natural history. Specimens of the new species were found in the grass on the ground at night. Once startled, they jumped away quickly. The collection site is surrounded by primary broad-leaved forest and bamboo. There are karst rocks nearby, no water body within a few hundred meters, and no courtship calls were heard. The collection site is in the nature reserve and the environment is not destroyed; this species is not threatened at present (Figure 6).

Distribution. This species is currently known only from the type locality, Nanxi Town, Hekou County,

Figure 6. Habitat of *Micryletta hekouensis* sp. nov. at the type locality in Nanxi Town, Hekou County, Yunnan Province, China. **A**. The collection site; **B**. The surroundings of the collection site.

Honghe Prefecture, Yunnan Province, China. It is expected to be found in neighboring Northern Vietnam.

Comparisons. *Micryletta hekouensis* sp. nov. differs from *M. aishani* by relatively smaller body size (SVL 20.5–20.8 mm vs. 22.1–27.3); snout abruptly rounded in dorsal view and slightly acuminate in lateral view (vs. snout shape nearly truncate in dorsal view and acute in lateral view); dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum brown to reddish brown with several blackish brown spots present on posterior parts of back and near groin); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to armpit).

Micryletta hekouensis sp. nov. differs from *M. dissimulans* by dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum reddish brown with merging irregular shaped brown blotches edged in beige); flanks black or greyish brown (vs. large black spots on flanks and axillary and inguinal areas present); white stripes on upper lips present (vs. absent); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to tympanum).

Micryletta hekouensis sp. nov. differs from *M. erythropoda* by relatively smaller body (SVL 20.5–20.8 mm vs. up to 30 mm); dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum gray or beige to saturated ochre or brick red, dark contrasting round or irregular shape spots irregularly scattered throughout the dorsum); venter without dark patterns (vs. with relatively distinct dark and light marbled speckling); outer metatarsal tubercle absent (vs. present); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to posterior edge of tympanum).

Micryletta hekouensis sp. nov. can be distinguished from *M. immaculata* by relatively smaller body (SVL 20.5–20.8 mm vs. up to 23.3–30.1 mm); dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum bronze brown to reddish brown without dark patterns); supratympanic fold indistinct (vs. distinct); supratympanic fold indistinct (vs. distinct); webbing between toes absent (vs. basal and poorly developed); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to tympanum).

Micryletta hekouensis sp. nov. can be distinguished from *M. inornata* sensu stricto from Sumatra, Indonesia, and from Tanintharyi, Myanmar, by dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum brownish grey with irregular blackish brown blotches and blackish brown streak); ventral side of body and limbs pinkish brown or pinkish grey with small and irregular white marbling patterns on chest and lateral belly (vs. ventral side of body and limbs light reddish grey without mottling, nearly immaculate, or chin, chest, and lateral belly with a few dark marbling patterns); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to eye).

Micryletta hekouensis sp. nov. can be diagnosed from *M. lineata* by supratympanic fold indistinct (vs. distinct); venter pink brown with small and irregular white marbling patterns on chest and lateral belly (vs. venter beige with light brown mottling along throat); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to eye).

Micryletta hekouensis sp. nov. differs from *M. nigromaculata* by supratympanic fold indistinct (vs. distinct); dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum brown to reddish brown with dark brown irregular hourglass shaped pattern and two large dark inguinal spots); flanks black or greyish brown (vs. flanks greyish white with dark patches or spots); white stripes on upper lips present (vs. absent); chin region in males brownish black (vs. whitish with light-gray marbling); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to eye).

Micryletta hekouensis sp. nov. differs from *M. sumatrana* by supratympanic fold indistinct (vs. distinct); dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum golden brown scattered with black spots); dark cross bands on tibia and tarsus absent (vs. present); venter without dark patterns (vs. with dark brown and cream mottling).

Micryletta hekouensis sp. nov. differs from *M. steinegeri* by relatively smaller body (SVL 20.5–20.8 mm vs. up to 30 mm); dorsum almost solid black or yellowish grey with brownish black stripes (vs. dorsum dark gray

to violet with irregular dark blotches or speckles); venter without dark patterns (vs. with grayish white and brown spots); webbing between toes absent (vs. rudimentary webbing); tibiotarsal articulation adpressed limb reaching level of front of eye (vs. reaching to tympanum).

Discussion

Yang and Rao (2008), Fei et al. (2009), Fei et al. (2012), and AmphibiaChina (2021) all recorded *Micryletta inornata* distributed in Menglun Town, Mengla County, Xishuangbanna Prefecture, Yunnan Province, China. *Micryletta inornata* sensu lato was widely reported from mainland Southeast Asia; however, recent phylogenetic studies have indicated that *M. inornata* sensu stricto is restricted to Indonesia and southern Myanmar, and the populations of *M. inornata* sensu lato contain several undescribed paraphyletic lineages with respect to other named taxa (Das et al. 2019; Munir et al. 2020; Miller et al. 2021). Therefore, the population distribution in Xishuangbanna remains to be studied.

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